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Nice Towers, eh?

Evaluating a Transmission Line in Arizona

As tourists meandered down the Apache Trail, a historic road with beautiful views of Central Arizona's desert mountains, power engineer Bill Phillips, photographer James Eastwood, and I carefully searched for the perfect tower to photograph for a HAER report on the 115,000 volt (115kV) Eastern Mining Area (EMA) transmission line. As the visitors stopped and looked past the power lines to enjoy the view, Bill turned to them and playfully remarked, "Nice towers, eh?"

In the spring of 1996, I completed a Historic American Engineering Record (HAER) report on a long-distance transmission line in Arizona. I found Bill's lighthearted comment relevant to cultural resource management, material culture, and technological history. This project taught me that technological structures are more than a blemish on the landscape. They are valuable cultural resources with a crucial story about the impact of long-distance power.[1]

The HAER report stemmed from a planned programmatic agreement between the Salt River Project (SRP) and the U. S. Forest Service (USFS). Recently, safety questions were raised about the towers, built under the supervision of the U. S. Reclamation Service in 1907. Engineers determined that they would have to dismantle some of them. The structures, like many SRP facilities, are in the Tonto National Forest. Before removing the towers, however, SRP must comply with federal regulations requiring a HAER report for significant historical resources. The SRP/USFS agreement will involve a standardized procedure for streamlining the Section 106 compliance process. Rather than address resources on a case-by-case basis, this agreement will allow the review of several SRP facilities on federal land through a single, standardized process. The following recounts the research and sources I used for my report.

This photograph, taken in March 1996 by James Eastwood, shows a Salt River Project transmission tower and line crossing the Superstition Mountains in Arizona. Remote objects like these are significant cultural resources, representing the development of 20th-century electric power technology.

When first assigned this report, I had no idea where to begin. What did the towers look like? Where exactly were they? To compound matters, I knew nothing about electricity beyond a few recollections from my eighth-grade science class. What did frequency and voltage mean? What is loading? I found ample secondary sources on the history of electricity and electrical transmission, but no studies on transmission lines or towers. As I searched through the list of HAER reports in the Library of Congress, the lack of independent reports about power lines and the role of long-distance transmission dismayed me. Luckily, I had access to SRPs water and electricity library and archives. I joined the History of Technology listserve to solicit more references.[2] However, overwhelmed by conflicting information and the sheer number and variety of towers in the desert, I found it necessary to combine company records and historic photographs with several site visits.

I drafted Bill Phillips from the power department for aid. Bill knew about the variety of towers, where they were, how old they might be, and if they had been modified. I soon discovered that other towers dated from the 1920s. Thus, one long-distance transmission loop included a variety of tower designs reflecting the rapid advances in this technology over the years. The oldest, erected in 1909, were adapted from pyramidal shaped windmill towers. Yet in less than 20 years, engineers altered the tops and added new hanging insulators to address lightening problems and to deter large desert hawks who used transmission towers for perches. Towers built in the 1920s were rectangular and were varied in design according to their function and location on the line as intermediate, angle, or transposition towers.

When evaluating this transmission line, I had a problem addressing it as a single cultural resource. Not only is it made up of hundreds of independent towers, it is miles long, has often been rerouted, and has segments constructed over a period of 20 years. The 1996 National

Conference on Public History (NCPH) in Seattle conducted a valuable session on interpreting linear resources. Bureau of Reclamation Historian Christine Pfaff's discussions about boundaries were especially valuable to my research decisions. It made sense to deal with the line in segments and to discuss only representative towers that embody the integrity, character, and feeling of the line.

Once I learned how to evaluate this multistructure resource, my research focused on its origin. The Internet proved valuable in finding sources. Annual U. S. Reclamation Service reports recorded that the U.S. Wind Engine and Pump Company in Batavia, Illinois, manufactured the towers. When I entered "Batavia" into the Yahoo! search engine for the World Wide Web, the town's webpage greeted me with the boast, "Batavia, Illinois, Windmill Capital of the World." Between the records from their historical society and a reference from a local windmill expert, I found ample information on the windmill manufacturers, including the Windmill Manufacturers Trade Literature Collection in Canyon, Texas. Old engineering journals in Arizona State University's science library (i.e., Electrical World) helped explain this adaptation of technological structures.[3] One afternoon, I even discovered a 1920s electrical supply catalog from Westinghouse in a used book store. This treasure details the forms and functions of each tower element and transmission wire, enabling me to match the exact insulator to those designated on the mechanical drawings in company archives.

David Nye's *Electrifying America* provided background on the effects of hydroelectric power on Salt River Valley farms and in mining towns. The Salt River Valley was one of the earliest and largest remote areas in the country to provide electricity to farmers before the Rural Electrification Act of 1936. Most mining operations were too far from hydroelectric sites to supply energy before advances in long-distance transmission. The mines had many uses for electricity—providing power for safe illumination, driving hoists, air compressors, ventilation equipment, mills, and tramming machinery. Small and powerful locomotives replaced mules for transporting minerals and equipment.[4]

The EMA transmission line stretches across the Superstition, Apache, and Pinal Mountains east of metropolitan Phoenix. It first conveyed power generated by Roosevelt Dam—the Bureau of Reclamations first large-scale work—to Phoenix and the rest of the Salt River Valley. The sale of power to local mines provided the revenue to expand the Salt River Projects (SRP) hydroelectric system and furnish valley farmers with electricity. The energy helped produce two of Arizona's most valuable economic resources, cotton and copper, during the early-20th century. Extant 115 kV towers serve as a testament to the federal government's role in bringing electric power to remote areas. They illustrate the rapid development in long distance, high voltage electrical transmission technology and tower design in response to society's economic needs.

Human use of natural energy resources, such as water, have interested western historians for some time. Thomas P. Hughes, David Nye, Mark Rose, and Ronald Tobey have written exhaustive accounts of electrification; but few have described the industrial and social impact of electrical technology outside urban areas. Transmission towers are as important as buildings, dams, or bridges. Long-distance transmission lines may intrude upon our natural landscape, but they are important cultural resources.

Notes

1 For a review of the impact of culture on tower design, see Eugene Levy, "The Aesthetics of Power: High-Voltage Transmission Systems and the American Landscape," *Technology and Culture* 37 (April 1996): 575-607.

2 To join the History of Technology listserve, send an email message to <LISTSERV@SIVM.SI.EDU>, no subject, with the message "SUBSCRIBE HTECH-L (YOUR NAME)." The list is home to informed historians, archivists, scientists, and engineers. Also see the Society for the History of Technology webpage for research links <www.umich.edu/~shotac/SHOT/index.html>.

3 The Hagley Museum and Library in Wilmington, Delaware has an extensive collection of trade catalogs. David Nye, *Electrifying America: Social Meanings of a New Technology 1880-1940*, Cambridge, MA, 1990, 204; Frederic Quivik, "Early Steel Transmission Towers and Energy for Montana's Copper Industry," *Montana: The Magazine of Western History* 38 (Fall 1988): 67-69.

4 Thomas P. Hughes, *Networks of Power: Electrification in Western Society 1880-1930*, Baltimore, MD, 1983; David Nye, *Electrifying America;* Mark Rose, *Cities of Light and Heat: Domesticating Gas and Electricity in Urban America*, University Park, PA, 1995; Ronald C. Tobey, *Technology as Freedom: The New Deal and the Electrical Modernization of the American Home*, Berkeley, CA, 1996.

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